Perturbations in CO_2 flux and subsequent chemosynthesis by chemoautotrophs in agricultural soil are induced by the addition of elemental sulfur S^o

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The microbial contribution to soil organic matter has been shown to be much larger than previously thought and thus its role in carbon cycling may also be underestimated. Among soil microorganisms, chemoautotrophs can fix CO_2 without sunlight and can glean energy through the oxidation of reduced elements such as sulfur. Here we show that the addition of sulfur to soil results in an initial surge in production of CO_2 through microbial respiration, followed by an order of magnitude increase in the capture of carbon from the atmosphere as elemental sulfur is oxidised to sulfate. Thiobacillus spp., take advantage of specific conditions to become the dominant chemoautotrophic group that consumes CO_2. We discern the direct incorporation of atmospheric carbon into soil carbohydrate, protein and aliphatic compounds and differentiate these from existing biomass. These results suggest that chemoautotrophs can play a large role in carbon cycling and that this carbon is heavily influenced by land management practises.